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ADAPATIVE SPEED CONTROLLING SYSTEM

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Abstract - *An In today's fast moving world vehicles are getting extremely numbered and as a result traffic jams and accidents are very common. Rash driving and over speed of vehicles lead to the demise of many people. Hence automation of speed control of the vehicle is the vital need of today's world. Our project "External Adaptive Speed Controlling System" is aimed at automatically controlling the speed of the vehicles at heavy traffic zones and critical areas like school zone, hospital zone etc. This system will help us to avoid traffic jams and accidents due to high speed of vehicles. The speed control of vehicles is done using RF (Radio Frequency) technology. RF transmitters/receivers are placed in traffic zones and vehicles. When vehicle enters these zones RF communication occurs and speed is controlled automatically. An additional feature provided by our system is that the traffic officials can control the traffic in particular zones by sitting in their offices itself. That is real time control of traffic is made easier. The officials can set the speed limit for a particular zone for a fixed time. This is made possible by using GSM network. The speed limit is send by the official using GSM modem as a message. Then the speed of the vehicle is reduced to that value in the message.*

Key Words: GSM, GPS, RF MODEM

1.INTRODUCTION

We know road accidents are increasing day by day, most of which are caused because the vehicles are driven at high speeds even in the places where sharp turnings and junctions exist. Reduction of number of such accidents is the prime step needed to be taken.Many systems have been developed to prevent these road accidents. One of them is the Cruise control system (CC) that is capable of maintaining speed defined by the driver and its later evolution version Adaptive Cruise Control (ACC)[1] that keeps the automobile at safer distance from the preceding vehicle. But these systems have no capability to detect the curved roads where the speeds of the auto mobiles have to be lowered to avoid the accidents. Later curve warning systems (CWS) have been developed to detect the curved roads by using Global Positioning System (GPS) and the digital maps obtained from the Geographical Information Systems (GIS) to assess threat levels for driver if approaching the curved road quickly. But these maps need to be updated regularly and are not useful if there are unexpected road diversions or extensions etc. We propose a dynamic model where the system controls the speed of the automobile according to the data in the frame that is transmitted by the RF transmitter fixed to the nearby signal unit. RF transceivers are kept in the vehicles which receive the speed limit as RF signals from the signal unit. The officials in the control unit can control the speed of a traffic zone by setting the speed limit and notifying the signal unit as a SMS with the help of GSM modems kept in the control unit and the signal unit, which in turn signals the vehicle unit transceiver.

The above mentioned vehicle unit implementation happens in real time, where as in our system we setup an model of vehicle unit and with help of a remote unit we control the speed of this vehicle model. This model can also be better utilized to improve the fuel efficiency by imposing the maximum speed limit on the automobiles at which the mileage will be more.

2. DESIGN OF THE SYSTEM

Adaptive Speed Controlling system is a dynamic model where the system controls the speed of the automobile according to the data in the frame that is transmitted by the RF transmitter fixed to the nearby signal unit. The transmitter will send RF signals to the vehicle unit from the signal unit about the speed limit once the vehicle is within the traffic zone. RF transceivers are kept in the vehicles which receive the speed limit as RF signals from the signal unit. The officials in the control unit can control the speed of a traffic zone by setting the speed limit and notifying the signal unit as a SMS with the help of GSM modems kept in the control unit and the signal unit, which in turn signals the vehicle unit transceiver.

The modules of the system include: vehicle unit, signal unit, control unit, remote unit. The above mentioned vehicle unit implementation happens in real time, where as in our system we setup an model of vehicle unit and with help of a remote unit we control the speed of this vehicle model. Here the remote unit is used for our system as we are not doing real time implementation. Hence the system proposed will have four modules which depend upon GSM technology, RF technology and PWM.

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vehicle unit and with help of a remote unit we control the speed of this vehicle model.

3. MODULES OF THE SYSTEM

The modules of the system include: vehicle unit, signal unit, control unit, remote unit.

3.1 VEHICLE UNIT

This unit consist of a microcontroller (ATmega328), LCD (LM016), RF data modem, DC motor with motor driver IC (L293D), RF bit receiver and a decoder, four LED bulbs, power supply and a bridge rectifier circuit, POT. Microcontroller (ATmega328) connects RF data modem, ignition switch, LCD, DC motor, RF bit receiver and decoder. DC have a motor driver IC (L293D) which controls the wheels of the vehicle unit. RF data modem receives the signals from signal unit. According to that speed limit, the actual speed of vehicle is reduced. RF bit receiver is used to get the signal bit by bit and then decode it into the data needed for the microcontroller to reduce the speed. LCD display shows speed limit, message sender number and speed limit of zone and vehicle status. It also shows zone over when no zone is selected or a zone is over. LED bulbs will indicate the operation going on in the vehicle unit controlled by remote unit. When the circuit is powered all the LED bulbs will glow at the same time. Bridge rectifier circuit will convert AC voltage to DC voltage and then given to microcontroller. POT is used to adjust the contrast of LED bulbs.

3.2 SIGNAL UNIT

Signal unit will be placed in the traffic zone area where we want to control the speed of vehicles that pass by. It comprises of GSM modem, microcontroller (ATmega328), RF data modem, LCD (LM016L), and button interface (zone selection switches). Here a slot in the GSM modem will be having a SIM card i.e, the number to which the control unit will send messages on speed limit. Microcontroller is central part which controls the signal unit to which RF data modem, LCD, GSM modem and button interface are connected. Microcontroller with EEPROM is used here since the SMS data containing the speed limit is stored here for further transmission. The LCD will display the zone status (name and speed limit of that particular zone), errors if any, number from which the message is received, speed limit obtained from message etc. In the button interface part there are two zone selection switches which are used for demonstration to switch from one zone to another, select a zone and even no zones are selected using the action performed on these switches.

3.3 CONTROL UNIT

Control unit is the speed governing part in our system. This unit helps the officials to send the speed limit of the traffic zone to the signal unit in the form of SMS. It comprises of GSM modem, user interface (PC), level shifter (MAX232 IC). GSM modem will have the SIM card (sender) i.e, the number from which control information on speed limit and zones are passed on to the signal unit by SMS. Level shifter is used to switch between GSM modem logic (RS 232 logic) to RF logic (TTL logic). MAX232 IC is for converting signal from serial port (RS-232) to signals suitable for TTL digital logic circuits. User PC is connected with GSM modem and the level shifter will have a form for selecting port number to which GSM modem is connected with the PC, speed limit to be set, signal unit receiver SIM card number, name of zone etc. and SMS is send using the send button. User interface is governed by visual studio software.

3.4 REMOTE UNIT

This unit is used to control the vehicle unit for demonstration. The main components used are encoder (HT12E), RF bit transmitter and four switches. Buttons are used for backward, forward, stop, increment and decrement operation. The encoder is for encoding the data received from signal unit. HT12E is used mainly in radio frequency applications for easy transmission and receiving of 12 bits of parallel data (in transmitter section of remote unit to carry signal from it).

4. ARCHITECTURE DIAGRAM

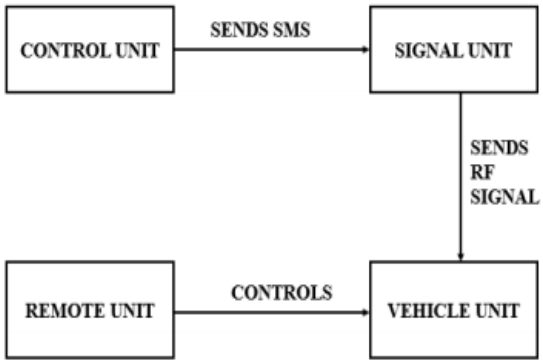

FIG 1: BASIC ARCHITECTURE DIAGRAM

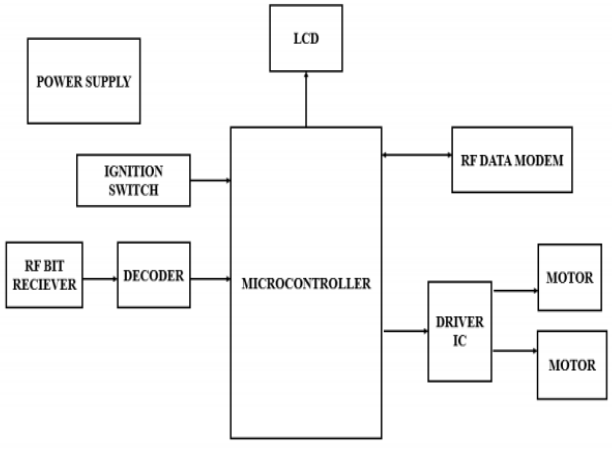

FIG 2: BLOCK DIAGRAM OF VEHICLE UNIT

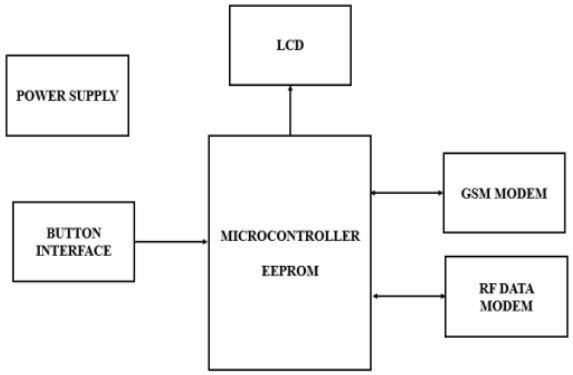

FIG 3:BLOCK DIAGRAM OF CONTROL UNIT

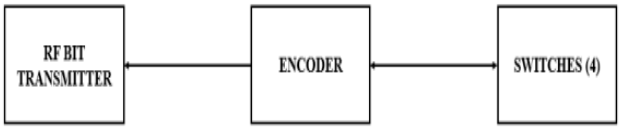

FIG 4: BLOCK DIAGRAM OF REMOTE UNIT

5. HARDWARE REQUIREMENTS

AT Mega 328:- Arduino ATMEGA-328 microcontroller [2] has been programmed for various applications. By using the power jack cable, arduino microcontroller has been programmed so that the execution of the program may takes place. Various kinds of arduino board are present in the market. Arduino software is installed in the computer and so that we can edit and upload the program according to the applications. Arduino software supports c and c++ programming languages. Various inputs and outputs are present in the arduino board and therefore simultaneously 8 input and output ports can be used for various applications. Some of the applications used by arduino boards are rotating general motor, stepper motor, control valve open, etc. ATMEGA 328 microcontroller, which acts as a processor for the arduino board. Nearly it consists of 28 pins. From these 28 pins, the inputs can be controlled by transmitting and receiving the inputs to the external device. It also consists of pulse width modulation (PWM). These PWM are used to transmit the entire signal in a pulse modulation. Input power supply such as Vcc and Gnd are used. These IC mainly consists of analog and digital inputs. These analog and digital inputs are used for the process of certain applications.

GSM Modem:- A GSM modem[3] is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. A GSM modem exposes an interface that allows applications such as SMS to send and receive messages over the modem interface. The mobile operator charges for this message sending and receiving as if it was performed directly on a mobile phone. To perform these tasks, a GSM modem must support an extended AT command set for sending/receiving SMS messages, as defined in the ETSI GSM 07.05 and 3GPP TS 27.005 specifications.

RF Data Modem :- Radio modems[4] transfer data wirelessly across a range of up to tens of kilometres. Using radio modems is a modern way to create Private Radio Networks (PRN). Private radio networks are used in critical industrial applications, when real-time data communication is needed. Radio modems enable user to be independent of telecommunication or satellite network operators. In most cases users use licensed frequencies either in the UHF or VHF bands. In certain areas licensed frequencies may be reserved for a given user, thus ensuring that there is less likelihood of radio interference from other RF transmitters. Also licence free frequencies are available in most countries, enabling easy implementation, but at the same time other users may use the same frequency, thus making it possible that a given frequency is blocked. Typical users for radio modems are: Land survey differential GPS, fleet management applications, SCADA applications (utility distribution networks), automated meter reading (AMR), telemetry applications and many more. Since applications usually require high reliability of data transfer and very high uptime, radio performance plays a key role. Factors influencing radio performance are: antenna height and type, the sensitivity of the radio, the output power of the radio and the complete system design.

FIG: GSM modem (SIM 300)

FIG: Signal unit hardware

6. CONCLUSIONS

The External adaptive speed controlling system is aimed at controlling the traffic jams and accidents by automatic control of vehicle speed. This system mainly consist of four modules namely control unit, signal unit, vehicle unit and remote unit. RF technology is used to control the vehicle speed. When the vehicle enters the particular zones RF communication occurs between the vehicle and zone, thus the speed is controlled. This system also provides another feature by which the officials can control and set the vehicle speed by staying in their offices itself. This is made possible through the GSM network. Speed limit is send as a message. So we can conclude that by using our proposed system the real time control of vehicle speed is possible. It avoids accidents and enable smooth traffic.

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